Supplementary Information

Preparation and enhanced visible-light photocatalytic activity of Pancake Rocks-like WO_{3-x}/C nanocomposite

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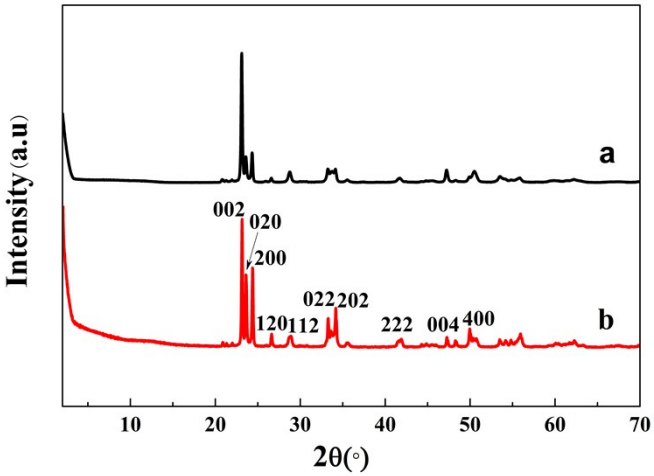

Fig.S1 The XRD patterns of the samples prepared by calcined $H_2W_2O_7$ in N_2 atmosphere(a) and $H_2W_2O_7$/DDA in air atmosphere(b)

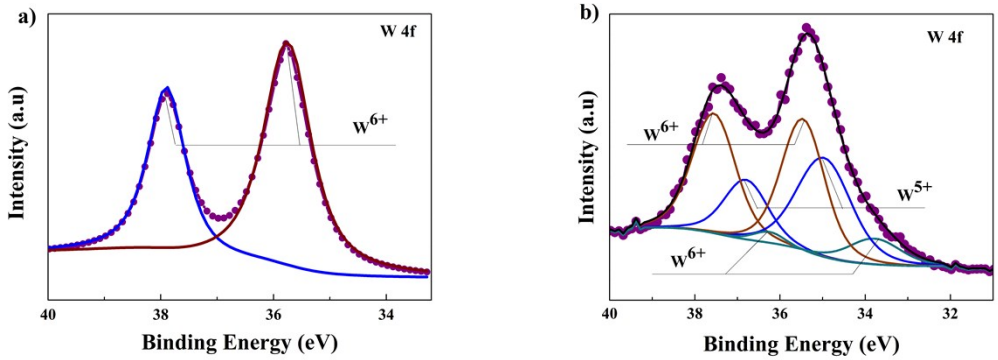

Fig.S2 W 4f (a) XPS spectra of the sample prepared by the $H_2W_2O_7$ calcined at 600°C in N_2 atmosphere and W 4f (b) XPS spectra of WO_{3-x}/C

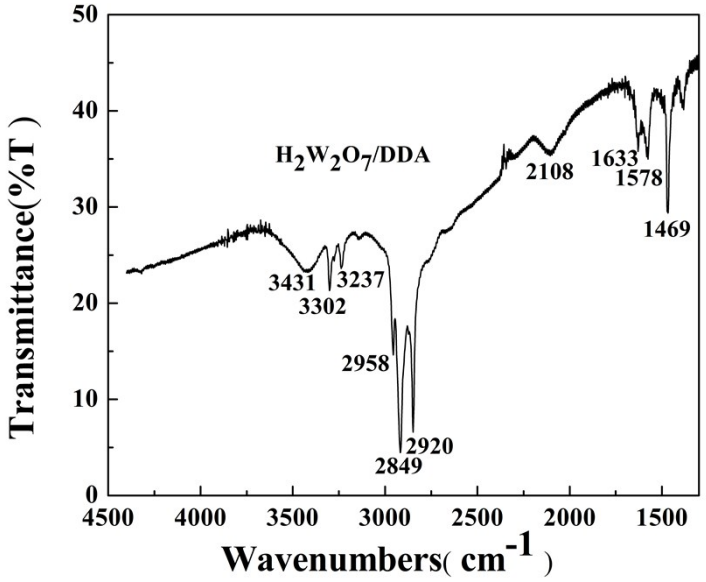

Fig.S3 Fourier transform infrared spectroscopy (FT-IR) spectra of $H_2W_2O_7$/DDA

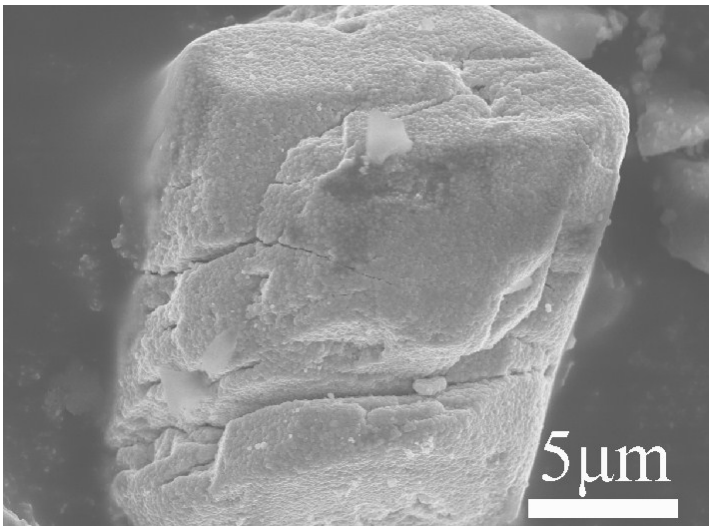

Fig.S4 SEM images of pure WO_3

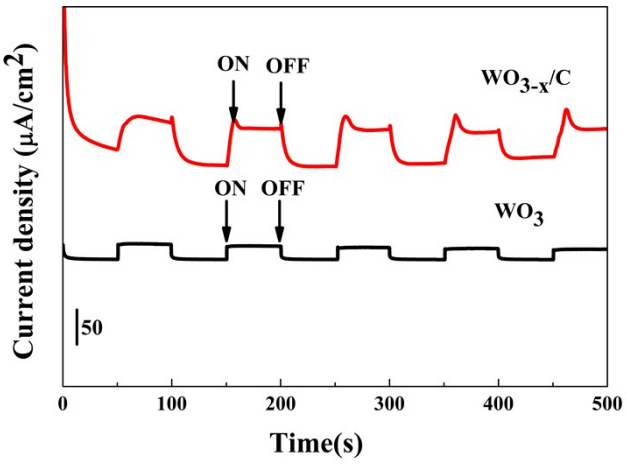

Fig.S5 The transient photocurrent responses of pure WO_3 and WO_{3-x}/C under visible-light irradiation

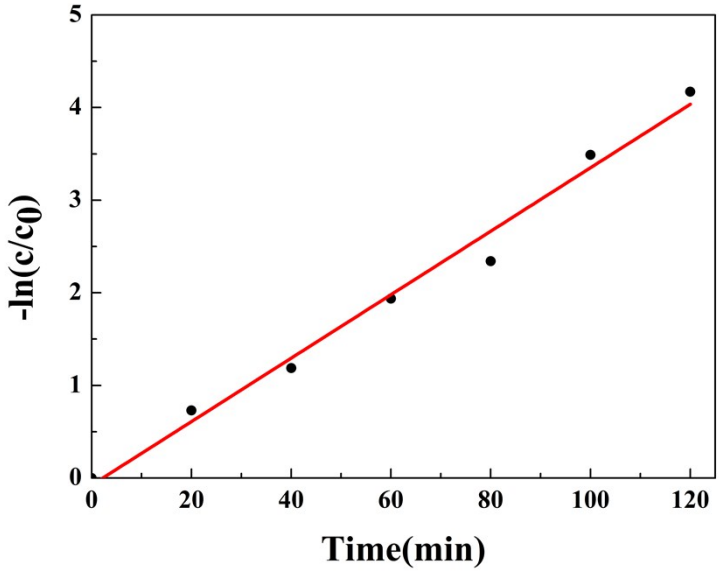

Fig.S6 Kinetics of RhB degradation with WO_{3-x}/C nanocomposite

Quantum yield (Φ) calculation

The rate of degradation of RhB (γ) was (2.89± 0.31)×10^{-3}mM·min^{-1}. The volume of reaction solution (V) was 0.02 L and the Avogadro's number (NA) was 6.02×10^{23}. Φ of the degradation of RhB at the central wavelength of the visible light (420nm) was calculated by the following formula:

$$\Phi = \frac{N_{RhB}}{N_{Abs}} = \frac{\gamma \cdot V \cdot N_A}{I_{irr} \cdot f_{Abs}}$$

$$f_{irr} = \frac{I_{irr} - I_{out}}{I_{irr}} = 1 - e^{Abs}$$

$$\Phi = \frac{\mathrm{N}_{RhB}}{I_{irr} \cdot \left(1 - e^{Abs}\right)}$$

Where f is the fraction of light adsorbed by the reaction suspension.

The energy of single photon at 420nm was:

$$\mathrm{E} = \frac{\mathrm{h} \cdot c}{\lambda} = \frac{6.626 \times 10^{-34} \times 2.998 \times 10^{8}}{420 \times 10^{-9}} = 4.73 \times 10^{-19}\,\mathrm{J}$$

where h is the Plank's constant and c is the speed of light.

The intensity of irradiation light was 0.63 $mW \cdot cm^{-2}$. The diameter of reactor was 3cm and the height of reaction solution was 4.2cm, thus the overall area absorption of light was 39.56cm^2.

The molar amount of degraded RhB per minute was:

$$\mathrm{N}_{RhB} = (2.89 \pm 0.31) \times 10^{-3} \times 10^{-3} \times 0.02 \times 6.02 \times 10^{23} = (3.48 \pm 0.37) \times 10^{16}$$

Number of photos was:

$$1\mathrm{mW} = 1mJ \cdot s^{-1} = 0.06J \cdot \mathrm{min}^{-1}$$
$$E_{irr} = 0.63 \times 39.56 \times 0.06 = 1.5J \cdot \mathrm{min}^{-1}$$
$$I_{irr} = \frac{1.5}{4.73 \times 10^{-19}} = 3.17 \times 10^{18}\ \mathrm{min}^{-1}$$

The absorbance of solution was 0.80. Therefore Φ, which equal to Therefore Φ, which equal to the number of molecules decomposed divided by the number of photons absorbed by WO_{3-x}/C nanocomposite, is as follows:

$$\Phi = \frac{\mathrm{N}_{RhB}}{I_{irr} \cdot (1 - e^{-Abs})} = \frac{(3.48 \pm 0.37) \times 10^{16}}{3.17 \times 10^{18} \times \left(1 - \mathrm{e}^{-0.8}\right)} = (2.0 \pm 0.21) \times 10^{-2}$$